

Remarks

Claims 2-10, 12-14, 19-23, 25, 26, 28 and 29 are pending in the application.

Claims 2-3, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US Patent #6,650,846, hereinafter Ito) in view of Miyamoto et al. (US Patent #7,116,917, hereinafter Miyamoto).

Claims 5-8, 9, 12-14, 19-20, 25, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol (US Patent #5,708,734, hereinafter Van Der Tol).

Claims 21, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol and further in view of Yao (US Patent #5,654,818, hereinafter Yao).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Fujiwara et al. (US PGPub 2003/0161638).

Each of the various rejections and objections are overcome by amendments that are made to the specification, drawing, and/or claims, as well as, or in the alternative, by various arguments that are presented.

Any amendments to any claim for reasons other than as expressly recited herein as being for the purpose of distinguishing such claim from known prior art are not being made with an intent to change in any way the literal scope of such claims or the range of equivalents for such claims. They are being made simply to present language that is better in conformance with the form requirements of Title 35 of the United States Code or is simply clearer and easier to understand than the originally presented language. Any amendments to any claim expressly made in order to distinguish such claim from known prior art are being made only with an intent to change the literal scope of such claim in the most minimal way, i.e., to just avoid the prior art in a way that leaves the claim novel and not obvious in view of the cited prior art, and no equivalent of any subject matter remaining in the claim is intended to be surrendered.

Also, since a dependent claim inherently includes the recitations of the claim or chain of claims from which it depends, it is submitted that the scope and content of any dependent claims that have been herein rewritten in independent form is exactly the same

as the scope and content of those claims prior to having been rewritten in independent form. That is, although by convention such rewritten claims are labeled herein as having been "amended," it is submitted that only the format, and not the content, of these claims has been changed. This is true whether a dependent claim has been rewritten to expressly include the limitations of those claims on which it formerly depended or whether an independent claim has been rewritten to include the limitations of claims that previously depended from it. Thus, by such rewriting no equivalent of any subject matter of the original dependent claim is intended to be surrendered. If the Examiner is of a different view, he is respectfully requested to so indicate.

Rejections Under 35 U.S.C. 103(a)

Claims 2-3, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto. Claims 5-8, 9, 12-14, 19-20, 25, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol. Claims 21, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol and further in view of Yao. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Fujiwara. The rejection is respectfully traversed.

According to MPEP §2143, to establish a prima facie case of obviousness under §103, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The Office Action fails to establish a prima facie case of obviousness, because the Ito and Miyamoto, alone or in any combination, fail to teach or suggest all the claim elements. Moreover, the cited references teach away from the claimed invention and are

simply not operative in the manner suggest by the Examiner. For example, the Applicants respectfully submit the prior art fails to teach or suggest at least the claim element “differential phase shift keying between two optical bits separated by an even number of bit periods.” The Office Action suggests this claim element is taught by Mayamoto FIG. 17; col. 11, lines 16-18; and col. 16, lines 39-50. The Applicants respectfully disagree.

Neither of the references to the claimed alternate-polarization (APol) differential-phase-shift-keyed (DPSK) modulation format. Both references are directed towards amplitude-shift-keyed formats ONLY and do not anticipate the application of their patents for APol-DPSK. Although the type of optical components used in the references are similar to what can be employed for the claimed invention, the references simply do not teach or suggest an arrangement even remotely approaching the claimed invention. Further, it is not a trivial matter to arrange the various components in a manner achieving the arrangement and results of the claimed invention. Modification of the two references to achieve an arrangement approaching the claimed invention depends upon improper hindsight

Ito teaches methods of optical transmission combining optical phase reversal from bit to bit and/or two ways of bit-wise polarization alternation. The goal of the invention is to minimize the degradation of amplitude-modulated signals due to the interplay of chromatic dispersion and the optical nonlinearities of the optical transmission fibers. Ito never discloses or suggests an implementation directed towards transmit and receive phase-shift-keyed (PSK) modulation formats.

Ito clearly fails to contemplate DPSK formats, including how to receive and decode the APol-DPSK formats. It is also noted that the portion of Ito describing “an intensity modulator 2, modulating optical signal with NRZ data; figure 13” is not directed to precoding a signal, but to intensity modulating an optical signal with an electronic data signal. That is, phase modulator 3 is not a data modulator; rather, it is adapted to introduce some phase difference in the adjacent bits to improve the nonlinear transmission tolerance of the system. In fact, phase modulator 3 cannot be used as a data modulator since the Ito arrangement is inoperative if both intensity modulator (modulator

2) and phase modulator. Thus, contrary to the Examiner's assertion, intensity modulator 2 cannot be replaced by a phase modulator since this will result in non-functional system.

The examiner also contends that the use of the precoder in Ito is substantially similar to the precoder use in our patent. This is incorrect. The precoder used in Ito (Fig. 8 and Fig. 12) has nothing to do with DPSK precoding. It is used to rotate the polarization of amplitude shift keyed signal only when the state of the NRZ drive signal changes the state (either from 0 to 1, or from 1 to 0).

The Examiner contends that the deficiencies in the teaching of Ito as they relate to the claimed invention are satisfied by Miyamoto. This is not correct. Specifically, the Examiner contends that Miyamoto discloses an even number of bit encoding and even number of bit delay line interferometer (Miyamoto figure 17, column 16 lines 16-18, column 16 lines 39-50). This is not accurate. Miyamoto discloses a method to generate a duobinary carrier-suppressed return-to-zero (DCS-RZ) signal from a differential phase shift keying (DPSK) signal. The two bit delay precoding and two bit delay optical filter in Miyamoto's patent (figure 17, Miyamoto) only work when the optical source is a "Dual Mode Beat Pulse Light Source", as a DCR-RZ signal has certain phase relationship between bits. If the source is not a "Dual Mode Beat Pulse Light Source", such as a CW source, the two bit delay precoding and two bit delay optical filter don't work. In our patent, the source is a CW source.

In the passages of Miyamoto referenced by the Examiner, Miyamoto discloses a "delay of the pre-coding unit 2" shown in Miyamoto FIG. 17 (see Miyamoto, col. 16, line 34-49). However, a unilateral *delay* of a bit stream has nothing to do with the claimed "differential phase shift keying between two optical bits separated by an even number of bit periods," be it any specific *delay* value mentioned in Miyamoto or otherwise. Rather, the claim element refers to specific bits between which Differential-Phase-Shift-Keying (DPSK) is being performed.

Moreover, Miyamoto decidedly does not teach "differential phase shift keying between two optical bits separated by an even number of bit periods," there is no motivation in Miyamoto to arrive at the claim element either, because the limitation occurs in the claimed invention to enable DPSK to be performed with APol-DPSK. Miyamoto does not teach, suggest, or provide motivation for utilizing any form of APol

modulation, much less the claimed APol-DPSK encoding method. But not only that, Mayamoto teaches performing “amplitude-shift-keying conversion” (see Mayamoto, Abstract) before transmission is performed. Thus, Mayamoto teaches away from transmitting a DPSK signal and thereby the invention.

The applicants note that, even taking the Examiner’s position that it is trivial to modify Fig. 13 to at least generate APol-DPSK signals (which we do not), the resulting arrangement would be inoperative. Specifically, the examiner argues that it is obvious to make phase modulator 3 to perform DPSK modulation. However, such a modification would result in a non-functioning system since this would provide a system of both amplitude and phase modulation with no means of decoding the received information. It is critical to understand that one needs to have a means of receiving and decoding the received information to have a working transmission system, not just a transmitter generating some unknown signal.

The Examiner is respectfully requested to consider *The Authoritative Dictionary of IEEE Standards Terms*’ definition of DPSK, which is:

*A method for encoding a signal in which the value of a bit stream is encoded on the differences between the phase of adjacent signals; that is, if the signals are in phase, the bit is a one; if not, the bit is a zero...*¹

The definition of DPSK above clearly shows that no *delay* (as in Mayamoto) is involved in the process and hence that is not what is being claimed. DPSK is instead based on the phase relationship between respective bits of a bit stream. Per the invention, the bits between which DPSK takes place are “separated by an even number of bit periods” so as the APol-DPSK encoding will be performed on bits “having the same polarization,” with respect to how they will be transmitted (see Specification, page 5, line 15). The Applicants would also amplify the novelty of the claimed invention over the prior art with respect to the (above) IEEE definition of DPSK, noting that IEEE had established the respective bits between which DPSK encoding was previously performed as being “adjacent” to one another. The claimed invention uniquely discloses DPSK performed between non-adjacent bits that are “separated by an even number of bit

¹ IEEE Press, *IEEE 100, The Authoritative Dictionary of IEEE Standards Terms*, Copyright 2000, Institute of Electrical and Electronics Engineers, Inc., page 304.

periods.” The Applicants have newly added independent claim 31 and claim 32 dependent thereon, pertaining to the novelty of this process in and of itself.

Ito and Mayamoto provide no motivation to be combined to arrive at “differential phase shift keying between two optical bits separated by an even number of bit periods,” because Ito discloses intensity modulation (see Ito, Intensity Modulator 2) as opposed to phase modulation. Thus, it is impossible for Ito to perform any semblance of the claimed “differential phase shift keying between two optical bits separated by an even number of bit periods” and Ito teaches away from the claimed invention for at least the same reasons as Mayamoto.

At least for the above reasons, the Applicants’ independent claims are allowable over the Examiner’s cited prior art under 35 U.S.C. 103. Since all of the dependent claims that depend from the independent claims include all the limitations of the respective independent claim from which they ultimately depend, each such dependent claim is also allowable over Ito in view of Miyamoto and/or any of the other cited references under 35 U.S.C. 103.

Therefore, Applicants respectfully request that the rejection of all the pending claims be withdrawn.

Further with respect to Van der Tol: the Examiner’s contention that this reference teaches execution of DPSK modulation and polarization alternation simultaneously using a single MZM is incorrect. Van der Tol contains two main arrangements: polarization insensitive phase modulator (Fig. 1) and polarization insensitive amplitude modulator (Fig. 2 and Fig. 3). It does NOT teach how to achieve DPSK nor polarization alternation. In fact, the devices in Van der Tol can NOT achieve polarization alternation. These devices are designed such that the polarization of the output is the same as the input polarization.


Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, the Examiner is invited to call Eamon Wall at (732) 530-9404 so that arrangements may be made to discuss and resolve any such issues.

Respectfully submitted,

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